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U. S. DEPARTMENT OF COMMERCE

NATIONAL BUREAU OF STANDARDS

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POLISHES

Contents

I. Introduction

In response to numerous requests from the public for information on various polishes and floor waxes, the following data have been collected. Many patents have been granted covering such preparations; abstracts of those issued during the past 30 years will be found in Chemical Abstracts, published by the American Chemical Society and available in public libraries. The National Bureau of Standards has not developed standard or recommended formulas for manufacturing polishes; those given in this letter circular have been obtained from various sources. As the Bureau has not tested many of these formulas, they are to be considered as suggestions to serve as a basis for experimentation.

II. Precaution

Gasoline, turpentine, mineral spirits, and many other volatile organic solvents are very flammable. In using these solvents, or preparations containing them, be sure to have good ventilation, and to avoid electric sparks, open flames, or smoking in the rooms or other spaces. Oily and greasy rags should be destroyed immediately after use or kept in closed metal containers. Animal and vegetable oils are the most likely to undergo spontaneous combustion.

III. Furniture and Automobile Polish

Polishes that are suitable for furniture can be used on automobiles also, provided the finishes are of the same type and in practically the same condition. Varnish, ordinary enamel, cellulose ester (lacquer), baked enamel, and synthetic resin finishes are the surfaces that are generally encountered. There are differences in the hardness of finishes, the fastness of colors, and the resistance to solvents and abrasives.

Furniture and automobile polishes should remove dirt and grease readily from the surfaces, restore their luster, and be nearly completely removable, so that the surfaces will not hold dust or retain any objectionable odor. Such polishes should contain no alkali or alkaline compound that will attack finishes; emulsions should be stable or constant; the nature and amount of solvents and oils used should be duly considered; for example, alcohol, benzol, and other solvents may seriously attack cellulose ester (lacquer) finishes. Nitrobenzene (nitrobenzol or "oil of mirbane") should not be used to impart odor to polishes, as its vapors are poisonous.

(a) Oil Polishes.- Most of the straight oil polishes consist wholly, or mainly, of a mineral oil. They are cheap and give a glossy polish if rubbed off thoroughly. Mixtures of mineral oil (paraffin oil) and linseed oil, usually with other ingredients, are also used. Linseed oil is a component of many polishes for varnished surfaces. Polishes containing it or other drying oil should be rubbed off thoroughly from the surface being polished. Cloths used for applying the polish and rubbing down the surface should be kept in tightly closed tin containers because of the danger of spontanceous combustion.

(b) Wax Polishes are made in paste and liquid form. Some of the emulsion polishes contain wax, such as beeswax, carnauba, bleached montan, ceresin, and synthetic waxes. Although beeswax is used in many polishes, the harder waxes with higher softening or "melting" points, such as carnauba wax, are to be preferred. Some of the wax polishes soften at fairly low temperatures and may whiten by long contact with water. Polishes showing these properties would be more satisfactory on furniture than on automobiles.

(c) Special Mixtures.- Most of the commercial polishes probably fall under this heading. They may consist of mixtures of oils, waxes, volatile solvents, abrasives, acetic acid (or vinegar), antimony trichloride ("butter of antimony"), camphor, drier, etc. Oil-soluble dyes are sometimes used to give a red or other color, and essential oils may be added to impart a pleasant odor or to mask the odor of certain ingredients. Many of these polishes are emulsions. The abrasive used in making a polish, or a combined polish and surface cleanser, should be selected with care in order not to scratch or otherwise mar finished surfaces. Pumice, tripoli, diatomaceous earth (infusorial earth, tripolite,

diatomite, kieselguhr, etc.), chalk, fuller's earth, bentonite, and air-floated silica are some of the commonly used abrasives. The abrasive should be a uniform and very finely powdered product. Very fine abrasives are apparently used in small amounts in the preparation of some polishes for cellulose ester (lacquer) finishes. The polishes for varnish and ordinary enamel coatings as a rule do not contain any abrasive, as these finishes are easily scratched.

(d). Suggested Formulas.-

1. Formula developed by the Bureau of Construction and Repair, Navy Department, for use on varnish and paint coatings on wood.

Material:	Pounds
Cider vinegar	125
Petroleum spirits	226
Turpentine	135
Denatured alcohol	22
Boiled linseed oil	100
Raw linseed oil	121

The quantities given above are sufficient to make 100 gallons of the polish. If ounces are used instead of pounds, the quantity will be 6 1/4 gallon. As this polish contains 4 to 6 percent of acetic acid (vinegar), it should not be put in metal containers.

2.

Raw linseed oil	pint	1
Turpentine	pints	2
Beeswax	ounces	1 to 2

Dissolve the beeswax in the linseed oil by heating slightly, remove from the source of heat, add the turpentine, and mix. Shake well before applying.

3. A straight mineral oil, neutral in reaction, such as transformer oil or paraffin oil.

4. Mix 1 pint of linseed oil, 3 pints of water, and 1 pint of denatured alcohol. Shake well before applying.

5. In discussing the formulation of furniture and automobile polishes Auch (1)[1] gives a number of typical formulas to serve as

[1] Numbers in parentheses indicate references listed at the end of the circular.

a guide in manufacturing such products. For example, he gives the following formula for the "oil and soap emulsion" type of furniture polish:

Material:	Parts (by weight)
Paraffin oil	25
Naphtha	12
Pine oil	1.5
Stearic acid (double-pressed)	4
Denatured alcohol	2
Triethanolamine	2
Water	53.5

Mix the first four ingredients, and warm the mixture (to about 140° F) until the stearic acid is completely melted. Mix the last three ingredients in a second container, and warm the mixture to about 140° F. Then add the latter mixture to the former in a thin stream while agitating, and continue the agitation until cool. By replacing part of the paraffin oil with "deodorized" kerosine or "varnish makers' and painters'" naphtha, the cleansing action might be increased and the tendency toward showing finger marks reduced. The addition of from 1 to 10 percent of a finely powdered abrasive in this formula would give a polish with more rapid cleaning power, but one that should be used cautiously to prevent marring the finish.

6. An an example of the "butter of antimony" type of polish, a formula recommended by the American Pharmaceutical Association (2) for use on coatings on wood has been used, as follows:

Material:	Parts (by volume)
Linseed oil	400
Alcohol	100
Oil of turpentine	100
Antimony trichloride solution (sp.gr. about 1.5)	25
Dilute acetic acid (about 6%)	100

Add the solution of antimony chloride last and mix thoroughly. This polish contains acid and, as in the case of (1), should not be put in metal containers.

7. Emulsion polishes similar to the following have been suggested as a "cleaner and polish" for cellulose ester (lacquer) finishes:

Material:	Parts (by weight)
Carnauba wax	4.5
Beeswax	2.0
Mineral spirits	39.0
Finely powdered diatomaceous earth or tripoli (325 mesh or finer)	12.5
Stearic acid	3.5
Triethanolamine	1.25
Water	37.25

Add the stearic acid and triethanolamine to the water, and heat to boiling in order to form a soap (triethanolamine stearate) solution. Dissolve the waxes in the mineral spirits by warming in hot water, add the abrasive to this solution, and mix by stirring or shaking; then add this mixture to the warm soap solution with agitation. The soap solution should not be too warm, otherwise the mineral spirits may boil out of the vessel. Shake well before applying.

This type of polish should be used with care to avoid marring the finish by too vigorous rubbing. Polishes which contain no abrasive are also in use for cellulose ester coatings. The formula listed, or a modification of it, could be used, omitting the diatomaceous earth or tripoli.

8. Wax polishes are widely used on both automobiles and furniture. A wax polish or coating gives a good finish, but requires more labor in its application than other types of polish, especially paste waxes. A paste wax may be made by the following formula:

Material	Parts (by weight)
Carnauba wax	2
Ceresin	2
Turpentine	3
Volatile mineral spirits	3

Melt the waxes by heating in a vessel placed in hot water (not over a fire), add the turpentine and mineral spirits, and cool the mixture as rapidly as possible, while vigorously stirring to produce a smooth, creamy wax.

This formula might be modified, as determined by experiment, by mixing other waxes with the carnauba wax base, for example, candelilla wax, chinese wax, montan wax. The carnauba wax might be replaced in part by some of the synthetic waxes and some of the varnish resins might be incorporated in the mixture. By increasing the amounts of turpentine and mineral spirits a liquid wax may be obtained.

9. Water-emulsion waxes, commonly called "no-rubbing" liquid waxes are also used on furniture, but are apparently not being used on automobile finishes, presumably because the emulsifier is not completely waterproof. Some of these emulsions may be detrimental to lacquer films.

It should be noted that the preparation of wax polishes requires experience and attention to the details, which must be determined experimentally for a particular mixture. For large-scale work, jacketed kettles heated by steam or hot water and cooled by running water, strainers, and motor-driven stirrers or agitators are used.

IV. Metal Polish

(a) General.- Although polishing powders are in use, metal polishes usually consist of some abrasive material in suspension in a liquid or semiliquid vehicle. The principal difference in composition between the paste and liquid polishes is in the vehicle employed. The abrasive materials should possess such hardness, fineness, and shape of particles as will best accomplish the desired result without scratching. Metal polishes should not contain mineral acids or other materials that may have an injurious effect on metals. They should not contain cyanides or nitrobenzene and should be free from disagreeable odor. Obviously, a milder abrasive, such as rouge (oxide of iron), powdered talc, or precipitated chalk (calcium carbonate), is required for highly polished surfaces than for relatively dull surfaces, such as kitchen utensils, for which various siliceous materials are generally employed. The vehicle in the pastes is usually a petroleum product (heavy mineral oil, vaseline, paraffin, etc.) or a fatty product (stearin, tallow, stearic acid, oleic acid, etc.) or both, to which soap and other materials (for example, oxalic acid, cream of tartar, etc.) are sometimes added. Pine oil is also a common and valuable solvent in soap-base metal polishes. It gives body and helps hold the abrasive matter in suspension. The nonflammable liquid polishes usually have as a vehicle water containing soap with kerosine and ammonia, or a mixture of kerosine or other petroleum distillate, with sufficient carbon tetrachloride to render the mixture nonflammable. The flammable polishes usually contain gasoline, kerosine, or other petroleum distillate. As a rule, where much tarnish is to be removed, the liquid polishes are more efficient than the pastes, but they should be used with care as they may contain flammable substances. The paste and liquid polishes sometimes contain essential oils to mask the odor of certain ingredients.

Polishing powders may be a single substance, such as rouge or chalk, or a mixture of various abrasives with or without added materials. On plated ware, such as chromium plate, nickel plate, silver plate, etc., only the mildest abrasive should be employed because of the thin coatings commonly used. Precipitated chalk, rouge, powdered talc, or other finely powdered abrasive, free from hard or gritty particles, would probably be the safest abrasive to use.

(b) Suggested Formulas.- From the numerous formulas in the formularies and in technical journals, the following have been taken at random:

1. Groggins and Scholl (3) have recommended orthodichlorobenzene as a cleaner for metals and as an ingredient of metal cleaners. A paste prepared by mixing 1 part of precipitated chalk with 5 parts of orthodichlorobenzene and applied with a cloth is said to be very effective for cleaning and polishing silverware and other metals in the home and for removing rain

spots from chromium-plated and nickel-plated automobile radiator shells. The compound may be mixed with other abrasives as absorbents to yield polishing pastes. Tableware and kitchen utensils polished with such products should be dipped into boiling water before they are used again.

2. A paste polish containing pine oil may be prepared as follows:

Material:	Parts (by weight)
Chip soap	10
Silica dust	20
Air-floated tripoli	20
Pine oil	2
Water	48

Dissolve the soap in the hot water, and add the previously mixed silica and tripoli with stirring; then add the pine oil, with stirring, and run the hot mixture into flat cans. The abrasive (silica and tripoli) should be of such fineness that practically all of it will pass through a No. 325 sieve.

3. The following has been suggested for an experimental liquid polish:

Material:	Parts (by weight)
Oleic acid	2.5
Orthodichlorobenzene	50
Pine oil	2.5
Diatomaceous earth (air-floated) . . .	10
Silica dust	10
Strong ammonia (26° Bé.)	2.5
Water	22.5

Thoroughly mix the first five ingredients, dissolve the ammonia in the water, and then add the ammonia solution to the mixture, with vigorous stirring.

Treating the clean, dry, metal surfaces with a protective coating retards tarnishing and should obviate the necessity of frequent repolishing. The Bureau has not developed formulas for these coatings, but as clear nitrocellulose lacquers containing synthetic resins or condensation products are being marketed for use on bronze, brass, and copper exposed to the weather, information about them can probably be obtained from the manufacturers.

Formulas 2 and 3 are from a paper by Auch (4) which also discusses at some length the formulation of silver polishes.

(c) Electrolytic Method for Silver.- This method is often used at home for cleaning silver and silverware. It depends upon the fact that when silverware is heated in a solution containing about 1/2 oz. of sodium bicarbonate (baking soda), and 1/2 oz. of sodium chloride (common salt) to each quart of water, in contact with certain metals, such as aluminum, magnesium, or zinc, the tarnish is removed with practically no loss of silver. In using this method it is necessary to rinse the articles very thoroughly with hot water after the treatment, otherwise they will tarnish more rapidly than usual. This method leaves the surface of the silver slightly dull, and if a bright finish is required it will be necessary to polish the surfaces slightly with a mild abrasive. Sometimes sal soda or trisodium phosphate is used in hot water instead of baking soda, in which case it may not be necessary to heat the solution after introducing the silverware.

The electrolytic cleaning of silver is described and discussed in a paper by Vinal and Schramm of the National Bureau of Standards (5). In this study the actual losses in weight were determined for several samples of silverware when cleaned electrolytically and by an abrasive.

V. Floor Polish

Floor polishes or waxes in general use fall into two classes, as follows: Volatile organic solvent class, known in the trade as paste and liquid waxes; and water-base emulsion class, known as water-emulsion waxes.

(a) Paste and Liquid Waxes.- These generally consist of a mixture of natural waxes or a synthetic wax in organic solvents, such as volatile mineral oil or turpentine or a mixture of such solvents, to produce the desired consistency. The natural waxes commonly used are carnauba, candelilla, beeswax, ceresin, ozokerite, and paraffin. The liquid waxes, which are in reality mainly suspensions or emulsions, are easier of application, as they have a larger proportion of solvent (volatile mineral oil or turpentine). Ammonia, water, and other substances have also been used in formulas for these products.

Formulas:	Parts (by weight)
1. Material:	
Carnauba wax	2
Ceresin	2
Turpentine	3
Gasoline (sp. gr. about 0.73)	3

Melt the waxes by heating in a vessel placed in hot water, add the turpentine and gasoline, and cool the mixture as rapidly as possible, while vigorously stirring to produce a smooth, creamy wax. This formula gives a paste wax. By increasing the amounts of turpentine and gasoline (say to a combined total of about 12 to 15 parts by weight), a more fluid or a liquid wax may be obtained.

2. Material: Amounts

Turpentine	pint -- 1
Beeswax	ounces -- 4
Ammonia water (10-percent strength)	ounces -- 3
Water	pint (about) - 1

Mix the beeswax and turpentine and heat them by placing the vessel in hot water until the beeswax dissolves. Remove the mixture from the source of heat, add the ammonia and the water, and stir vigorously until the mass becomes creamy. This wax should be applied lightly on varnished or shellacked floors and any excess wiped off at once, as the ammonia may attack the varnish or shellac. When this wax is used on unfinished oak flooring, the ammonia may cause a slight darkening of the wood.

Paste or liquid wax should be applied in very thin coats and thoroughly rubbed with a heavy waxing brush or motor-driven brush, or a heavy block wrapped in burlap or carpet. In preparing a new or refinished wood floor for waxing, it is common practice to apply a coat of shellac varnish or other quick-drying varnish before waxing. If this is done, it is better to have a very thin coating of shellac, as thicker coatings are apt in time to crack or peel, which will necessitate complete refinishing. The wax can be applied directly to close-grained woods such as maple or pine, or to such open-grained wood as oak, if a "silicate wood filler" is first applied. This treatment requires more waxing, and therefore mor labor, in the original job, but the finish is likely to be more durable. However, floors finished in this way often darken more readily than if the wax is applied over a thin coat of shellac. Wood floor sealers are now being used for the sealing of close-grained wood or in the sealing of open-grained wood which has been treated previously with wood filler. The sealed floors are then waxed.

(b) Water-Emulsion Waxes.- These emulsions, commonly called nonrubbing, "self-polishing" or "dry-bright" polishes or waxes, are now widely used on wood, cement, linoleum, rubber tile, cork, asphalt tile, mastic, and other floorings. Many of them dry rapidly and require little or no polishing. They usually consist of carnauba wax (and other waxes) dispersed in a water solution of soap, although other emulsifying agents are sometimes used. In their preparation, a small amount of natural or synthetic resins is often employed. A simple carnauba wax-soap-water emulsion may be prepared for experimental purposes as follows:

Dissolve 1 part by weight of castile soap in 16 parts of clean, soft water, and heat the solution to boiling. Add to the boiling soap solution, with constant stirring, 4 parts by weight of a good grade of carnauba wax (cut into small pieces). When a smooth homogeneous emulsion is obtained, cool to a temperature of 135° F by quickly adding, with constant stirring, the necessary quantity of cold water. (This should take about 14 to 16 parts more of water). Let cool, filter through cheesecloth, and stir in about

0.5 percent of formaldehyde as a preservative. The product so obtained should be of the color and consistency of cream. A thicker or thinner product may be made by decreasing or increasing the quantity of water used, taking care to maintain the given ratio between soap and wax. This wax mixture may require polishing or buffing after drying in order to obtain a glossy surface.

Formulas

The following information and formulas for the preparation of a "triethanolamine-carnauba wax dry-bright polish" were furnished some time ago by a manufacturer:

"Shellac has been incorporated in this polish to cut down the slipperiness of a straight carnauba wax emulsion. A dry-bright polish can also be made as directed by merely leaving out the shellac solution and adding the water used in it to the wax emulsion. The addition of the shellac seems to make it spread more evenly and, as stated, makes a film that is not quite so slippery. It is necessary to use a good grade of light-colored carnauba wax (known in the trade as "No. 1"), and the directions for making the polish must be carried out as described. The temperature should never be above 100° C (212° F) at any time."

The polish is made as follows:

Material:	Trial batch	Large batch
Carnauba wax	72 g	13.2 lb
Oleic acid	9.1 ml*	1.6 pt, or 1.5 lb
Triethanolamine	10.6 ml	1.9 pt, or 2.1 lb
Borax	5.4 g	1.0 lb
Water (boiling)	500 ml	11.5 gal
Shellac (dry flakes) . .	10.0 g	2.2 lb
Ammonia (28 percent) . .	1.75 ml	0.35 pt, or 165 ml
Water (room temperature).	100 ml	2.0 gal

*milliliters

Trial Batch: First, melt the wax and add the oleic acid. Temperature should be about 194° F. Placing the container in boiling water keeps the polish at a suitable temperature.

Second, add the triethanolamine slowly, stirring constantly. This should make a clear solution.

Third, dissolve the borax in about 5 ml of the boiling water and add to 2. Stir for about 5 minutes. This gives a clear, jelly-like mass.

Fourth, add the rest of the boiling water, slowly with constant stirring. An opaque solution should be obtained. Cool.

Fifth, add the 100 ml of cool water to the shellac and then the ammonia, and heat until the shellac is in solution. Cool.

Sixth, add the shellac solution to the wax solution and stir well. The resulting solution should give a clear film when applied to linoleum, mastic floors, etc.

Glickman (6) discusses at length the preparation of water-emulsion waxes, giving a number of suggested formulas. In discussing the above formula he states: "Experience indicates that the presence of shellac in the product is of little value. If any ammonia is desirable in the finished product, it can be added anyway." He suggests the following modification of the above formula and procedure:

Material:	Pounds
Carnauba wax	13.2
Oleic acid	1.5
Triethanolamine	2.2
Borax	1.0
Water	131.2

This formula gives a wax with about 12 percent of total solids.

First, heat the wax and oleic acid together in a kettle until a uniform mixture is obtained, and most of the mechanically inclosed water is driven off - until there is no, or very little, foam on the surface. The temperature should be kept close to 212° F.

Second, add the triethanolamine slowly, with agitation, to the oleic acid-wax mixture. In order to insure the addition of all of the triethanolamine, the latter may be heated in a separate container until it is very thin (fluid) and then added; the container is then rinsed with some of the borax solution, or, if conditions prevent, with the water used for dilution after the addition of the borax solution. The rinsings should be added to the borax solution, which is preferable, or to the boiling water. The solution after mixing should assume a clear brown color.

Third, raise the temperature of the mixture obtained in step 2 to about 216° to 218° F; add the boiling borax solution (borax dissolved in an equal weight of water) slowly in intermittent batches, if done by hand, and in a very thin stream, if added from another and smaller kettle. The agitation must be continued and the temperature carefully controlled. The mixture, during the addition of the borax solution, should not suddenly become of a pasty yellow color; should this happen, stop adding the borax and stir andheat the mixture until it becomes clear brown in color. After the borax has been added, the mixture should be stirred until practically all bubbles have disappeared.

Fourth, again raise the temperature of the mixture to 216° to 218° F, and add the water (heated to boiling) slowly, with rapid and thorough agitation. The color of the mixture should remain clear brown. The mixture gradually increases in viscosity, and care should be taken that additions of water are absorbed before further portions are added. When about 60 percent of the total amount of water has been added, the clear brown and viscous mixture suddenly changes in viscosity, showing streaks of the clear brown mass in a milky solution. When all of the water (boiling hot) has been added with rapid and thorough agitation, the emulsion should be grayish, fluorescent, and translucent in appearance.

Fifth, cool the mixture rapidly with the agitation continued. Filter before packaging.

Glickman states that the "Nos. 2 and 3 North Country" grades of carnauba wax seem to give better results as regards particle size and fineness of dispersion than the No. 1 grade. The addition of a material such as shellac to the finished wax dispersion is mainly for the purpose of increasing the gloss of the film. Bleached, dewaxed shellac should be used, if shellac is to be incorporated. The shellac dissolved in ammonia and water or borax solution may be mixed (with stirring) with the cold wax dispersion or the warm mixture, but should not be added to the hot wax mixture. In making water -emulsion waxes, care must always be exercised that all of the wax be treated alike with alkali (triethanolamine or other alkali) and acid (oleic acid, etc.), as well as borax, to insure uniformity of dispersion. Robertson and Wilson (7) suggest the use of the organic amine, morpholine, in the preparation of water-emulsion waxes. The reader is referred to the original paper for a discussion of the properties of this compound and suggested formulas in which it is used.

The preparation of water-emulsion waxes on a large scale requires special equipment, such as jacketed kettles for heating with steam and cooling with cold water (separate kettles for hot water, for borax solution, and for the wax), stirring devices, and special thermometers.

Water-emulsion waxes are usually applied with a lamb's wool applicator or a cotton cloth mop. They should be applied to clean, dry surfaces and spread as thinly as possible. It is common practice to treat the flooring with a suitable sealer before waxing. Sometimes two coats of wax are applied, the first coat serving as a sealer or undercoater. A water-emulsion wax when properly applied should dry to a hard, lustrous film in less than 30 minutes. The gloss of the dried film may be increased by a slight buffing.

An important problem in the use of paste and liquid as well as water-emulsion waxes is the slipperiness of the dry film. Many manufacturers claim to have some ingredient in their products that will give a so-called "nonskid" or "nonslip" wax. However,

it is doubtful if there is such a thing as an absolutely skid-proof waxed surface. Small amounts of natural or synthetic resins, rubber, and probably gums have been incorporated in waxes to reduce the slipperiness of the dry film. The product used must be compatible with the other ingredients of the wax and should not impair its polishing or wearing properties.

VI. Glass Polish and Cleaner

Polishes for glass are generally powders or pastes. Precipitated chalk, calcined magnesia, crocus or rouge (iron oxide), "putty powder" (tin oxide), and fine siliceous materials are the abrasives usually employed. In addition, they frequently contain soap, sodium carbonate, trisodium phosphate, or ammonium compounds (or ammonia) for the purpose of removing grease, etc.

The most common liquid cleaners for windows and mirrors are clear water or water to which has been added a synthetic wetting agent or detergent, sodium hexametaphosphate, sodium tetraphosphate, tetrasodium pyrophosphate, washing soda, borax, ammonia, kerosine, or alcohol. Trisodium phosphate or soda ash might be used instead of washing soda, borax, or ammonia. Alkaline solutions and solutions containing alcohol should not come in contact with paint, lacquer, varnish, or enameled surfaces.

Some of the liquids used for cleaning automobile windshields and windows have been essentially solutions containing about 15 to 25 percent by volume of straight grain alcohol or denatured alcohol, colored with a dye and sometimes perfumed. In some cases a little glycerol or ethylene glycol was present. Mixtures of isopropanol (isopropyl alcohol) and water, and water solutions of other alcohols or solvents (such as "methyl cellosolve" and "butyl cellosolve"), with and without a small amount of a synthetic wetting agent and some ethylene glycol, have also been used. One branch of the Government has used the following mixture (expressed as parts by volume) as a "comparative standard" in determining the performance of commercial products: Isopropyl alcohol 10, ethyl alcohol 27, ethylene glycol 3, and distilled water 60. Mixtures reported in the recent literature are: (a) 20 to 50 percent water solution of isopropyl, methyl, or ethyl alcohol with 0.02 to 0.2 percent of tetrasodium pyrophosphate or tetrapotassium pyrophosphate; (b) diethylene glycol 8 fluid oz, water 120 fluid oz, and a small amount of ethyl alcohol colored with dye and perfumed; (c) 20 to 30 percent water solution of propyl or isopropyl alcohol and about 0.1 percent lactic acid.

These solutions are generally sprayed on with an atomizer, and the glass is then wiped off with a soft cloth.

VII. Stove Polish

Stove polishes may be obtained as powders, so-called liquids, pastes, and sticks or cakes. Graphite is usually the basic ingredient. Finely powdered graphite may be used directly as a stove polish after mixing with a little water. Lampblack, carbon black, and bone black are sometimes added to deepen the color, but these forms of carbon are more readily burned off than graphite. Nigrosine (a black aniline dye) has also been used to deepen the color of such polishes. Stove polishes may contain, in addition to graphite and other forms of carbon, such materials as copperas (ferrous sulfate), soap, "water glass" (sodium silicate), waxes, gums, sugar, glycerol, water, oils, turpentine, etc. Turpentine or other readily flammable liquids should not be used in such polishes. The liquid polishes are generally of two types: (a) Graphite suspended in a water solution of sodium silicate, soap, etc.; and (b) a suspension of graphite in a petroleum distillate (oil) mixture, or such a mixture with the addition of carbon tetrachloride to render it nonflammable.

VIII. Shoe Polish

The ordinary black shoe polishes generally contain wax (beeswax or carnauba wax), nigrosine (a black dye), sodium or potassium carbonate solution, soap, turpentine, etc. After the wax has been emulsified by boiling in the soda (or potash) solution (a solution of borax may also be used), the emulsion is mixed with a hot aqueous solution of ordinary laundry soap and sufficient nigrosine to give the desired depth of color. This cools to a soft paste. If the liquid form is desired, a good grade of castile soap (pure olive oil-soda soap) or a soft (potash) soap may be substituted for the laundry soap. Another method is to dissolve carnauba wax or candelilla wax or a mixture of the two with beeswax and ceresin or paraffin in hot turpentine and mix with very finely pulverized bone charcoal. Tallow, lard, neat's-foot oil, spermaceti, rosin, gums, and various other materials have been used in making shoe polishes.

Brown shoe polishes consist of such substances as soft soap, wax, glycerol, linseed oil, turpentine, shellac, etc., to which is added some dye; for instance, annatto, aniline yellow, etc.

White shoe dressings are usually made up of pigment, adhesive or binder, a cleaner, and water. Sometimes, an organic solvent or a mixture of solvents is also used. When they contain glue, albumin, or other organic binder, a preservative will be required. Some of these dressings are perfumed. Titanium dioxide, lithopone, zinc oxide, titanium pigment (about 25 percent of titanium dioxide and about 75 percent of calcium carbonate), zinc sulfide, talc, precipitated chalk, china clay, magnesium carbonate, magnesium oxide, and other materials have been used as pigments. Among the cleaners that

have been used the following are mentioned: Trisodium phosphate, triethanolamine, soap, alcohol, and other organic solvents. Various gums (such as karaya and tragacanth), dextrin, gelatin or glue, albumin, bleached shellac solution (in borax or ammonia), casein, and soap have been used as binders or adhesives. Phenol, sodium salicylate, salicylic acid, or a suitable essential oil may be used as a preservative.

The following formulas and information have been furnished by a manufacturer:

1. Cleaner for such leathers as Russia calf, black or tan vici, and white kid.- Dissolve 8 oz of granulated castile soap in 1 gallon of hot, soft water, add 3 1/2 gallons of warm, soft water, cool, add 16 oz of ethyl ether, and mix.

2. Patent-leather cleaner.- Dissolve 4 oz of granulated castile soap in 1 gallon of hot, soft water, cool, add 2 quarts of denatured alcohol, and then 16 oz of ammonia water (specific gravity 0.90), mix.

3. Water polish or dressing.- Dissolve 1 part by weight of castile soap in 16 parts of clean, soft water, and heat the solution to boiling. While constantly stirring the boiling soap solution, add 4 parts by weight of a good grade of carnauba wax or other suitable wax, as Japan wax or beeswax (cut into small pieces). When a smooth homogeneous emulsion is obtained, cool to a temperature of 135° F by quickly adding, with constant stirring, the necessary quantity of cold water. (This should take about 14 to 16 parts more of water.) Let cool, filter through cheesecloth, and stir in about 0.5 percent of formaldehyde as a preservative. The product so obtained should be of the color and consistency of cream. A thicker or thinner product may be made by decreasing or increasing the quantity of water used, taking care to maintain the given ratio between soap and wax. The polish may be colored by thoroughly stirring in a strong solution of a suitable water-soluble dye; for example, for a black plish, add a solution of 1 part of nigrosine dissolved in 12 parts of water.

4. Oil polishes.- Many of the formulas for an oil polish, such as the turpentine paste polishes, do not include soap at all, being made up of a wax base and a small amount of other materials with about 75 percent of turpentine. Some of the firm paste polishes are made with a small amount of soap, beeswax, ceresin, and carnauba wax, with about 75 percent of turpentine.

Auch (8) has suggested the following formulas to serve as a basis for experimentation in the preparation of white shoe cleaners or dressings:

5. Liquid dressing.

Material:	Parts (by weight)
Lithopone	20 to 22
Disodium phosphate	1 to 2
Bentonite	1 to 2
Perfume	0.1 to 0.3
Water	77.9 to 73.8

This is a mechanical mixture to which any desired amount of a selected binder may be added and a preservative, if required. The lithopone may be replaced in whole or in part with other pigments.

6. Cream or paste dressing.

Material:	Parts (by weight)
Lithopone	60 to 65
Toilet soap chips	6 to 8
Sodium silicate	0.3 to 0.5
Perfume	0.3 to 0.5
Water	33.4 to 26

The addition of a small amount of talc or zinc stearate would aid in the application of the paste. The paste should be packed in tin tubes. Aluminum would be attacked by the alkaline mixture and lead would be affected by the lithopone, giving the paste a dirty gray color.

7. Emulsion type dressing.

Material:	Parts (by weight)
Titanium pigment	20 to 24
Triethanolamine	0.9 to 1.2
Gum damar	2 to 4
Oleic acid	2 to 2.5
Carbon tetrachloride	10 to 12
Naphtha (gasoline)	12 to 14
Water	53.1 to 42.3

Mix the carbon tetrachloride and naphtha, dissolve the damar in the solvent mixture, and then add the pigment, with stirring, to the solution. Dissolve the triethanolamine in the water, warm to about 135° F and add the oleic acid slowly with agitation. Then, while stirring vigorously and continuously, add the gum-pigment-solvent mixture in a thin stream to the soap-water solution. Care, skill, and preliminary experimental work are required to obtain a stable emulsion. This formula may be varied, as determined by experiment.

The following formula has been suggested for a leather preservative that will permit polishing:

Material:	Parts (by weight)
Carnauba wax	2
Beeswax	2
Neat's-foot oil	1
Turpentine	4

Melt the mixture of waxes and neat's-foot oil by heating in a vessel placed in hot water; add the turpentine, allow the mixture to become homogeneous, and remove from hot water; then immediately stir vigorously and continuously until the mixture is cool (room temperature). After the mixture has cooled somewhat, the vessel containing it may be placed in cold water to hasten the cooling, but the stirring must be continued.

If the above formula gives too stiff a paste, the turpentine may be increased to 5 or 6 parts by weight. This would have to be determined by experiment. A stirring or mixing device and jacketed vessels (for hot water and then cold water) would be advisable for quantity production. This mixture should be applied to the clean, dry leather with a rag, rubbed hard until no more material is absorbed and finally polished with a clean cloth. A higher polish will be obtained by reduction of the quantity of oil, but the leather will not be so well preserved.

IX. Polishing Cloth

Cloths for polishing furniture may be of cotton, wool, or silk. Some firms use cheesecloth and others a wool cloth made specially for the purpose. Cheesecloth is probably the easiest to obtain, since it is widely used for purposes other than polishing, and is the most economical. Wool and silk cloths are more expensive, and when made for polishing furniture are woven so as to be soft and nonabrasive.

Polishing cloths or rags intended primarily for use on metals often consist of woolen fabrics which have been saturated with fatty oil, mineral oil, or paraffin, or mixtures of these, containing in suspension a very finely powdered abrasive, such as tripoli or infusorial earth. Fatty acids have been used with paraffin in the preparation of such cloths, but may cause corrosion on some metals if a film of the acid remains. Muslin rags are also in use. Suspensions of tripoli (or other abrasive) in soap solutions, or mixtures of soap solutions, pine oil, ammonia, etc., have also been used for preparing polishing cloths. Some of these mixtures are colored with dyes and may contain a little essential oil. A polishing cloth might be prepared as follows: Dissolve a fatty oil (such as cottonseed oil), mineral oil (transformer oil or paraffin oil), or paraffin in gasoline, add the abrasive and mix thoroughly, pass the cloth through the suspension, and then stretch the cloth and allow to dry in this condition. If a vegetable oil (linseed, cottonseed, etc.) is used on wool, dry in a good circulation of air in a cool place not exposed to direct sunlight, in order to avoid danger of spontaneous combustion.

The following formula has been suggested (9) for preparing cloths for polishing brass and other metals:

Material:	Parts (by weight)
Soda soap	5
Water	35
Glycerin	5
Oleic acid	7
Fine tripoli	35
Ammonia water 10% (sp.gr. about 0.96)	5
Denatured alcohol	8

Heat the water to boiling and dissolve the soap in it, then stir in the glycerin. Warm the oleic acid and stir it into the water-glycerin solution; then, while stirring freely, add the tripoli. Add the ammonia water while stirring the mixture, let cool partially, and then stir in the alcohol. Dip the cloths in the mixture while it is still warm (40-45° C), remove, and let dry at room temperature. (The glycerin serves as a humidifying agent to keep the cloths moist enough for flexibility).

X. Dust Cloth, Oiled

These cloths are commonly referred to as "dustless dust cloths". Such cloths may be made by saturating a fabric with kerosine, hanging up to allow the more volatile part to evaporate, and then rubbing the oiled cloth on a wooden surface until it no longer streaks. These cloths may also be made by saturating them with a gasoline solution of paraffin, paraffin oil, linseed oil, or rapeseed oil, or a mixture of these, wringing out, and drying at room temperature. Sometimes essential oils or certain resins are added to the impregnating mixture.

XI. Specifications

The following Federal Specifications can be purchased at 5 cents a copy from the Superintendent of Documents. "Federal Standard Stock Catalog, Section IV, Federal Specifications, Part I, Index", which lists all Federal Specifications, with prices, can be purchased, price to be obtained from the Superintendent of Documents.

Remittance should be made by coupons (which may be purchased from the Superintendent of Documents in sets of 20 for $1.00), postal money order, express order, or New York draft payable to the "Superintendent of Documents, Government Printing Office, Washington 25, D. C." Currency may be sent at sender's risk. Postage stamps should not be sent, and defaced or smooth coins, or foreign money positively will not be accepted. Publications are forwarded without charge for postage to addresses in the United States and its possessions; also to Mexico, Canada, and certain other countries that extend the franking privilege.

Specification Symbol	Title
C-B-191	Beeswax; Technical Grade
P-P-546	Polish; Automobile, Liquid
P-P-552	Polish; Furniture, Liquid
P-P-556a	Polish; Metal
P-P-567	Polish; Shoe, Paste
P-P-571b	Polish; Silver
P-P-576	Polish; Stove
P-W-134	Wax, Floor; Solvent-Type, Liquid (With Resins)
P-W-151a	Wax, Floor; Water-Emulsion
P-W-158	Wax, General-Purpose; Solvent-Type, Liquid and Paste (For Floors, Furniture, Etc.)
DDD-C-441	Cloths; Polishing
P-C-451	Cloth; Abrasive, Aluminum-Oxide
JJJ-W-141	Wax; Carnauba
TT-T-291	Thinner; Paint, Volatile Mineral Spirits
VV-P-121	Paraffin (Wax)
LLL-T-791b	Turpentine; Gum-Spirits and Wood (Steam-Distilled)(For) Paint
LLL-T-792a	Turpentine; Wood (Destructively-Distilled)(For) Paint

XLI - References.

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